

[PROC. ROY. SOC. VICTORIA 46 (N.S.), Pt. I., 1933.]

ART. IV.—*Notes on Porotermes and Calotermes (Isoptera) from the Australian Region, with Descriptions of New Species.*

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(With Plates I. and II.)

[Read 13th July, 1933; issued separately 22nd December, 1933.]

This paper contains a further discussion on the synonymy and distribution of *Porotermes*, biological notes on *Calotermes* (*Calotermes*) *repandus* and *C. (Neotermes) irregularis*, a note on the rediscovery of *C. convexus* in Tasmania, further descriptions of, and notes on, *C. spoliator* and *C. tillyardi*, description of *C. (Glyptotermes) neotuberculatus*, notes on the synonymy, habits, and distribution of *C. (Cryptotermes) buxtoni*, and descriptions of *C. (Cryptotermes) queenslandis* and *C. (Cryptotermes) atratus*.

All of the above species are of importance in the destruction of seasoned constructional timber or living trees.

POROTERMES ADAMSONI (Froggatt).

Proc. Linn. Soc., N.S.W., xxi., p. 532, 1896.

In a previous paper(1) on this genus it was suggested that the three named Australian forms of *Porotermes* are probably conspecific. Since then a very considerable number of colonies have been critically examined, with the result that the writer no longer has any doubt that *P. grandis* Holmgren and *P. froggatti* Holmgren are synonymous with *P. adamsoni* (Froggatt).*

The principal differences between the three forms are size and colour. The smallest and lightest-coloured form is *P. adamsoni*, from New South Wales, Federal Capital Territory, and South-eastern Victoria, the intermediate form, *P. froggatti* Holmgren, from Tasmania, and the largest and darkest, *P. grandis* Holmgren, from Otway Forest, the mountain districts of South-eastern Victoria, and the mountain districts of the Federal Capital Territory (3,500–4,100 feet).

In the following tabulations, which supplement those given in my previous paper(1), measurements are given of the smallest and largest examples in each of three typical colonies. The antennae in both the winged adult and the soldier have from fifteen to eighteen segments.

Localities.—New South Wales: Uralla, Galston, Brooklana, Leura, Gosford, Tuggerah Lakes, Mittagong, Kiandra. Federal Capital Territory: Lee's Spring, Uriarra, Blundell's Farm, Canberra, Kowen. Victoria: Melbourne, Gisborne, Riddell, Monbulk, Gembrook, Cockatoo, Emerald, Ferntree Gully,

* It is of interest to note that according to Dr. Harold Kirby the Protozoa of these three forms are identical.

Warragul, Taggerty, Donna Buang, Lower Tarwin, Healesville, Warrandyte, Korumburra, Otway Forest, Cann River, Tatong. Tasmania: Scottsdale, Herrick, Launceston.

Biology.—The winged adult has been taken in Canberra, F.C.T., at a light indoors on 24th January; in a rotten log near Scottsdale, Tasmania, on 30th January; and in a similar position at Lee's Spring, F.C.T., from 1st to 7th February. On the latter date very many "swarmed" from another part of the same log from 5.30 p.m. to 7.30 p.m., the greatest numbers emerging at about 6.30 p.m. From 7.30 p.m. until 9.30 p.m. none appeared, and when the log was opened up on 11th February none was found in the galleries. During the flight none appeared at a camp lamp in the near vicinity, but many de-alated examples were found then and during the following morning running over the ground and logs nearby. A list of known indigenous host plants and some biological notes are given elsewhere(2).

Winged Adult.

	Canberra, Federal Capital Territory.	Scottsdale, Tasmania.		Lee's Spring, Federal Capital Territory.	
	One Example.	Minimum.	Maximum.	Minimum.	Maximum.
	mm.	mm.	mm.	mm.	mm.
Length, with wings ..	14·25	15·50	17·00	16·00	17·75
Length, without wings ..	8·60	10·50	11·00	8·00	11·00
Head, to apex of labrum, long	1·85	1·96	2·36	2·03	2·25
Head, to apex of labrum, wide	1·70	1·85	1·92	1·92	1·96
Pronotum, long* ..	0·74	0·88	0·92	0·74	0·81
Pronotum, wide ..	1·51	1·77	1·92	1·62	1·73

* Measured along the midline in all cases.

Soldier.

	Canberra, Federal Capital Territory.		Herrick, Tasmania.		Lee's Spring, Federal Capital Territory.	
	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.
	mm.	mm.	mm.	mm.	mm.	mm.
Total length ..	9·50	12·00	12·00	13·00	11·50	15·00
Head, with mandibles ..	3·75	4·50	4·20	5·00	4·50	7·00
Head, wide ..	2·40	2·92	2·59	3·21	2·81	4·07
Gula, narrowest part ..	0·37	0·48	0·55	0·62	0·51	0·66
Pronotum, long ..	0·81	0·96	0·96	1·14	0·99	1·29
Pronotum, wide ..	1·66	1·88	1·92	2·33	1·96	2·77
Tibia iii long ..	1·81	1·96	1·77	2·22	2·22	2·55

CALOTERMES (CALOTERMES) REPANDUS Hill.

Entomologist, lix., p. 297, 1926; *Insects of Samoa*, Part 7, Fasc. 1, p. 6, 1927; *Proc. Roy. Soc. Vic.* (n.s.), xxxix., p. 21, 1926.

This species was described from Samoa, where it occurs in living and rotten trees; this, or a very closely allied species, has been recorded also from Fiji. Recent reports, accompanied by specimens of soldiers and larvae only, indicate that it is causing a good deal of damage to buildings in Suva, Fiji.

CALOTERMES (NEOTERMES) IRREGULARIS Froggatt.

Proc. Linn. Soc. N.S.W., xxi., p. 525, 1896, Hill. *Proc. Roy. Soc. Vic.*, (n.s.), xxxviii., p. 195, 1926.

This species is now recorded from the following additional localities:—Queensland: Yarraman (soldiers and larvae in a log of *Eucalyptus crebra*) and Thursday Island (soldiers and larvae in living mango trees; alates and others in a living tamarind tree, 10th March). The soldiers in the Thursday Island series differs slightly from the type, but appear to fall well within the range of variation found in examples from the mainland. Mr. H. N. Hockings, from whom the specimens were received, states that most of the mango and some of the tamarind trees on this island are infested with this species.

CALOTERMES (subgen. ?) CONVEXUS (Walker).

Termes convexus Walker, *Brit. Mus. Cat., Neuroptera*, p. 527, 1853. Hagen, *Linn. Entomol.*, xii., p. 45, 1858.

(Plate I., Fig. 1.)

This species does not appear to have been recognized since the publication of Walker's description of the unique type (alate adult) from Tasmania. Hagen, after comparing the types, concluded that the somewhat larger *T. obscurus* Walker from Swan River is not otherwise different from the Tasmanian species. In 1920 Sir G. A. K. Marshall, at the writer's request, re-examined the then much damaged types and compared recently collected material from Swan River with them; his conclusions indicated that the two are specifically distinct.

Dr. R. J. Tillyard on 12th February, 1933, collected two winged adults (male and female) floating on the Macquarie River, about 25 miles from Launceston, Tasmania. These have been identified from the descriptions of Walker and Hagen as *Calotermes convexus* (Walker). I have also confirmed the views of Sir G. A. K. Marshall. Holmgren(4) considers that the soldier and "worker" described by Froggatt as *C. convexus* do not belong to this genus but to *Porotermes*; he includes them under *P. froggatti* Holmgren, which I now consider to be conspecific with *P. adamsoni* (Froggatt) and *P. grandis* Holmgren.

It is probable that *C. convexus* lives in small colonies in branches and branch stubs in living *Eucalyptus* trees, and that when sought for in these places it will be found to be not uncommon.

Description of the Wings.—The venation very variable. The subcosta about as long as the wing is wide at the suture. Radius about twice as long as subcosta. Radial sector with about 12 branches. Media of the male parallel with the radial sector to the apex of the wing, a little nearer to the radial sector than to the cubitus; cubitus parallel with the media, passing through the middle of the wing, with many branches. Media of the female (Fig. 1) joining the radial sector before the middle of the wing; cubitus joining the radial sector midway between the termination of the media and the apex of the wing. In the hindwings of the female and in one hindwing of the male the venation is similar to the forewing of the former, in the other wing of the male the cubitus runs to the apex, parallel with the media through the middle of the wing. The wing membrane is dotted moderately densely with the scale- and spine-like micrasters.

Measurements.

	mm.
Length with wings	♂ 8.00; ♀ 8.50
„ without wings	♂ 4.50; ♀ 5.00
Head, from base to apex of labrum, long ..	1.29
„ from base to clypeofrontal suture, long ..	0.99
„ wide	1.03
Antennae long (13 segs.)	1.48
Eyes, diam.	0.26
Pronotum, long 0.66; wide	1.15
Forewings, long* 6.00; wide	1.85
Tibia iii, long	0.74

* Measured from suture in all cases.

CALOTERMES (subgen. ?) SPOLIATOR Hill.

Proc. Roy Soc. Vic. (n.s.), xlv., p. 136, 1932.

(Plate I., Figs. 2-5.)

Winged Adult.

Very similar to *Calotermes tillyardi* Hill, from which it is distinguished by the antennae, wing venation, slightly larger size, and lighter colour of the ventral surface.

Head (Fig. 2).—Antennae with 13-14 segments; the 1st segment one-third longer than the 2nd; 2nd, 3rd and 4th subequal, or 3rd longer than 2nd and 4th; 5th-13th increasing in length progressively; 14th about as long and wide as 8th. Eyes subtriangular (horizontal diam. 0.225-0.240). Ocelli very small (maximum diam. 0.075), one-fourth their short diameter from the eyes.

Wings (Figs. 3-5).—Very similar to *C. tillyardi*, from which they differ as follows:—Generally a little narrower in proportion to length; subcosta of the forewing sometimes obsolescent; the media as heavily chitinated as is the radial sector, very variable, always nearer to the radial sector than to the cubitus and always

approaching or joining the former in the distal half of the wing, if only approaching the radial sector then connected with it by several short crossveins, if joining the radial sector then often branched, the branches sometimes forming a series of loops with the radial sector, both types of venation sometimes occur on opposite wings of the same individual; the cubitus always passes through the wing distinctly above the middle, sometimes joined to the media by short crossveins, with numerous branches, the distal ones joining the wing margin above, at, or just below the apex.

Imago.

Measurements.

	mm.
Length with wings	8.75-9.50
" without wings	6.00-7.00
Head from base to apex of labrum, long	1.22-1.33
" from base to clypeofrontal suture, long	0.96-0.99
" at and including eyes, wide	1.00-1.03
Antennae, long	1.40-1.48
Pronotum, long 0.59-0.74; wide	1.18-1.40
Forewings, long 6.00-6.75; wide	1.66-1.96
Tibia iii, long	0.74-0.80

Localities.—Federal Capital Territory (type locality): Uriarra and Black Mountain, at elevations of from 2,000 to 2,600 feet. New South Wales: several localities near Sydney.

Biology.—This species occurs rather commonly in the Federal Capital Territory in branch stubs and in the sap- and truewood in the vicinity of fire-damaged areas in living trees of *Eucalyptus maculosa* and *E. micrantha* at from a few inches from the ground to a height of 28 feet. Soldiers only, or soldiers, larvae, and nymphs, have been taken twice in association with the same castes of *Calotermes oldfieldi* var. *chryseus* and once in very close proximity to, if not in association with, *Calotermes neotuberculatus*, n. sp., in a tree which was infested also with *Heterotermes ferox* and *Coptotermes acinaciformis*. On another occasion alates and soldiers were taken with, or very close to, a group of individuals including larvae of *Porotermes adamsoni* and soldiers of *C. neotuberculatus*. The alate form has been taken from 27th January to 31st March.

Affinities.—The similarity of the imago to *C. tillyardi* has been noted above; both appear to belong to the same as yet undefined subgenus as *C. rufinotum* (from Victoria, South-Eastern New South Wales and Federal Capital Territory), *C. obscurus* (from Western Australia) and *C. convexus* (from Tasmania), but the soldier is markedly distinct from those of *C. rufinotum* and *C. tillyardi* (the soldier of *C. convexus* is not known).

Type (morphotype) winged adult in the collection of the Division of Economic Entomology, C.S.I.R., Canberra.

CALOTERMES (subgen. ?) TILLYARDI Hill.

Proc. Roy. Soc. Vic. (n.s.), xliv., p. 138, 1932.

(Plate I., Figs. 6 and 7.)

Several errors occur in the published description of this species owing to the inclusion of details, including a figure of a wing, which should have been attributed to *C. spoliator*, the slightly larger winged adult of which was not recognized as such at the time owing to its remarkable similarity to the species under notice.

From a study of the abundant material of both species which has been collected during the past summer, it is possible to define the specific differences in the winged adults of the two species, to describe the hitherto unrecognized winged form of *C. spoliator*, to state that the soldier described under *C. tillyardi* is correctly referred to that species, and to record the apparently restricted distribution of the latter species.

Description of Wings.—The following is an amended description of the wings:—Short and moderately wide. Subcosta and radius of the forewing (Fig. 6) short, the former sometimes obsolete, the latter rarely branched; the radial sector with from 9 to 12 or more branches to the costa, the distal branches sometimes forked; the media passes through the anterior third of the wing, parallel with the radial sector with which it never unites, very little closer to the radial sector than to the cubitus, stout at the base but not so dark as the radial sector, the remainder of the vein paler but distinct to its termination at the apex of the wing; the cubitus passes through the wing at or a little above the middle and runs parallel with the media, with many branches all of which terminate well below the apex of the wing; the radial sector of the hindwing has from 5 to 7 branches. The entire membrane and all the veins are dotted with minute scale-like and still smaller spine-like micrasters.

Measurements (amended).

	mm.
Length with wings	8.50-9.00
„ without wings	4.00-5.00
Head, from base to apex of labrum, long	1.18-1.25
„ from base to clypeofrontal suture, long	0.92-1.00
„ wide	1.00
Antennae, long	1.36-1.40
Pronotum, long, 0.62-0.66; wide	1.14-1.33
Forewings, long, 6.00; wide	1.88
Tibia iii, long	0.70-0.77
Eyes, diam.	0.255-0.260
„ from lower lateral margin of head	0.40

Locality.—Federal Capital Territory: Brindabella Mountains, at elevations from 3,000-4,100 feet.

Biology.—The associates of *C. tillyardi* in the same system of galleries in trees are, as far as is known, *Calotermes oldfieldi* var. *chryseus* and *C. rufinotum*. There is no evidence of interbreeding between the first and last-mentioned species with the second, but there is some reason to believe from an examination of the soldiers found in mixed colonies that this does occur between the first and last-mentioned species. The occurrence of several young de-alated adults of *C. tillyardi* and *C. rufinotum* in the same galleries has been observed on several occasions. The winged adult has been taken from 5th December to 10th March.

CALOTERMES (GLYPTOTERMES) NEOTUBERCULATUS, n.sp.

(Plates I. and II., Figs. 8-13.)

Winged Adult.

(Figs. 8-11.)

Colour.—Head, thorax and dorsum of abdomen very dark-brown (as in *C. tillyardi* and *C. spoliator*); under surface somewhat paler; tarsi and antennae buckthorn brown; anteclypeus whitish; labrum mars yellow.

Head.—Small, broadly rounded behind the eyes, finely shagreened and clothed with a few short hairs. Antennae of 13 segments; the 1st segment short and stout; 2nd shortest and narrowest of all; 3rd distinctly longer and wider than 2nd and 4th, narrowed at base, 4th globose, 5th-12th globose, increasing in length and width progressively; 13th very short and narrow. Eyes small, rounded or sub-triangular (0.195 x 0.225 diam.), 0.150 from lower lateral margin of head. Ocelli very small (0.060 diam.), round, in contact with the eyes.

Thorax.—Pronotum (Fig. 11) slightly narrower than head, markedly convex, the borders margined, and with a scanty fringe of short hairs, widely concave in front, anterolateral angles slightly rounded, sides nearly parallel to the widely rounded posterolateral angles, posterior margin broadly rounded, deeply and widely notched medially. Posterior margin of meso- and metanotum very wide and concave.

Wings (Figs. 8-10).—Short and narrow, dark brown. Subcosta very short, about one-third as long as the wing is wide at the suture; radius about three times longer than subcosta; radial sector and media typical of the subgenus; stout, running parallel with and close of the costa; cubitus passing through the middle of the wing, with 9-11 branches, the proximal four or five stout, the others indistinct; membrane and veins covered with scale-like micrasters only.

Legs.—Moderately short and stout; tibial spurs long, not serrated.

Measurements.

	mm.
Length with wings	7.00
" without wings	4.25-5.00
Head, from base to apex of labrum, long ..	1.07
" from base to clypeofrontal suture, long ..	0.85
" at and including eyes, wide ..	0.96-1.03
Pronotum, long, 0.51-0.62; wide ..	1.11
Forewings, long 3.40; wide ..	1.51
Tibia iii, long	0.77

Soldier.

(Figs. 12 and 13.)

Colour.—Head amber brown, mandibles reddish brown at base, black at apex; pronotum a little paler than head, remainder of insect ochraceous.

Head (Figs. 12 and 13).—Much longer than wide, nearly parallel on the sides, broadly rounded behind, a large blunt prominence on each side near the dorsolateral corners of the frons, with a few comparatively long hairs, frontal and transverse sutures distinct, eyes large and very distinct. Gula long and markedly narrowed at the posterior third. Mandibles short and stout, the left with three very short blunt evenly spaced teeth in the middle third, the right with two larger closely spaced teeth, the basal one showing beyond the apex of the labrum. Antennae with 11 segments; the 1st short, stout and dark in colour; 2nd about one-fourth as long as 1st; 3rd shortest and narrowest of all or as long and wide as 2nd; 4th to 10th short and wide, about equally wide, increasing very little in length progressively; 11th as long as 10th, but much narrower.

Thorax.—Pronotum about as wide as head, anterior margin straight on sides, widely and deeply concave in the middle, slightly bent upwards, the anterior half of sides of the sclerite nearly straight, thence broadly rounded to the rounded and slightly concave posterior margin, clothed with very few hairs of comparatively large size. Posterior margin of meso- and metanotum very wide and slightly concave.

Abdomen.—With very few hairs, these comparatively large.

Legs.—Very short and stout, clothed only with a few long stout hairs, femora of hind legs very stout, half as wide (0.296) as long; tibial spurs very short and stout, without serrations, 3:3:3.

Measurements.

	mm.
Total length	5.00
Head, base to apex of mandibles, long ..	2.22
" wide	1.00
Mandibles, left (dissected out)	0.74
Gula, at narrowest part, wide	0.26
Pronotum, long 0.53; wide	1.07
Tibia iii, long	0.52-0.60

Localities.—Federal Capital Territory (type locality): Black Mountain, Uriarra, Weetangera, Cotter River Water Reserve, at elevations from 2,000-2,400 feet. New South Wales: Galston, Manly.

Biology.—Small colonies have been taken in branch stubs and adjacent truewood of living trees of *Eucalyptus macrorrhyncha*, *E. micrantha* and *E. maculosa*. The Galston specimens include one alate and one soldier taken with a large colony of *C. spoliator* (alates, soldiers, &c.) in a living tree of *E. macrorrhyncha* on 6.2.30. The Manly specimens, labelled "greenwood termite," include several wings, one soldier and some larvae (in balsam) from Froggatt's collection. The alate form has been taken on 4th January on the wing during the day in Canberra.

Affinities.—The alate form is very closely allied to *C. (G.) eucalypti* Froggatt, from which it is distinguished by its appreciably smaller size, and darker colour. The soldier resembles *C. (G.) tuberculatus* Froggatt in having large blunt prominences on the frons, but these are relatively wider apart and not so well developed. Apart from its much greater size Froggatt's species may be distinguished by differences in the mandibles and antennae. The images of the two species are very distinct in size and colour.

Types (king, queen, and soldier) in the collection of the Division of Economic Entomology, C.S.I.R., Canberra.

CALOTERMES (CRYPTOTERMES) BUXTONI Hill.

Entomologist lix., p. 298, 1926 *Insects of Samoa*, part VII., fasc i, p. 9, 1927.

In the latter paper the writer referred to the occurrence on several islands in the South Pacific Ocean of several forms closely allied to the above, descriptions of which were deferred owing to lack of adequate material for examination. No further specimens have been received from either Tutuila Is. (Samoan group) or from Vavau Is. (Tonga group), but several additional series are now available from Fiji and Thursday Is., a study of which leaves little doubt but that they are conspecific with *C. buxtoni*.

In one colony, containing many alates, soldiers, nymphs and larvae, which was taken from a short length of badly damaged floor bearer of Brown Tulip Wood (*Tarricta argyrodendron*) in a large wooden building on Thursday Island, there are four soldiers of *C. buxtoni* and five of *C. secundus* Hill. The alates agree closely with the former species, and also with two alates collected in July and August last at a lamp near Darwin, N.T., the type locality for the latter species. In an earlier paper (3) the Thursday Island species, now regarded as *C. buxtoni*, is referred to under the manuscript name *C. torresi*. It may be mentioned that flooring boards of Kauri (*Agathis Palmerstoni*) from ? Queensland are attacked by this species on Thursday Island.

C. repentinus, described from alates only from Rabaul and Toma, New Britain(3), appears to be conspecific with *C. buxtoni*, but it may be noted that whilst many of the alates and soldiers in each of several recently collected colonies agree with the types, there are others of both castes which show such marked variation as to suggest specific differentiation.

C. gulosus, described from alates and one soldier from Kaile, Papua(3), agrees very closely in both castes with certain examples from Rabaul; it is possible that this species too should be referred to *C. buxtoni*.

It is evident from an examination of the available material that the alates and soldiers from the same colony of *Cryptotermes* sometimes exhibit such marked individual differences in size and form as to render satisfactory identification a matter of great difficulty. The habits of *Cryptotermes* as borers and dwellers in seasoned wood (furniture, constructional timber, &c.) would favour the wide distribution of species from island to island by commerce; it is suggested that *C. buxtoni* and *C. secundus* have been distributed by this means, and, further, that they may have been introduced originally from some of the islands of the North Pacific where very close allies are known to exist.

Cryptotermes are now well established as pests of furniture and building timber on the islands mentioned. On Thursday Island, whence many reports have been received during the past ten years, at least one large building has been very seriously damaged as a result of attacks on both hardwood and softwood timber. On the other hand, in Darwin, Northern Territory, and Townsville, N. Queensland, where *C. secundus* and *C. primus* respectively have been known for many years, damage has been negligible so far, although wooden telephone insulator spindles have been attacked recently in the latter State.

CALOTERMES (CRYPTOTERMES) QUEENSLANDIS, n. sp.

(Plate II., Fig. 14.)

Winged Adult.

(Fig. 14.)

Colour.—Head, thorax, wing-veins and abdomen dark brown; antennae and legs, excepting tibiae and tarsi, lighter brown; anteclypeus whitish; labrum, tibiae and tarsi buckthorn brown; wing membrane brown, lighter than veins.

Head.—Small, longer than wide, widest behind the eyes, narrowed anteriorly, clothed with a few very short hairs and minutely shagreened. Eyes small (0.250×0.290 diam.) and prominent, 0.140 from lower lateral margin of head. Ocelli very small, in contact with the eyes. Antennae with 14-16 segments; the 1st and 2nd segments short and stout; 3rd nearly always the shortest and narrowest of all; 4th to penultimate segments

increasing in size progressively; the last segment distinctly smaller than the four or five preceding it. Labrum strongly convex, wider than long, widest across the middle, anterior half broadly rounded, the apical margin hyaline. Postclypeus very short, one-third the length of the anteclypeus, anteclypeus one-third as long as wide, anterior margin concave.

Thorax.—Pronotum large, much wider than head, markedly arched dorsally, the surface minutely shagreened, clothed with a few short hairs, the border margined, anterior margin broadly concave, the sides, posterolateral angles and posterior margin rounded, posterior margin slightly notched medially, several deep impressions in the anterior one-third beginning near the anterior margin midway between the middle and lateral margin and extending posteriorly and diagonally towards the midline. Meso- and metanotum wide and broadly concave. Stumps of the forewings very large, rugose, almost completely covering those of the hindwings, base of the veins very distinct.

Wings (Fig. 14).—Short and moderately wide; subcosta of forewing short, about as long as width of wing at suture (wanting in hindwing); radius a little more than twice as long as subcosta; radial sector with seven branches to the anterior margin of wing; media stout at each end, passing through the anterior third of the wing and joining the radial sector beyond the middle; cubitus traversing the wing a little above the middle, with about 10 branches, the last of which joins the margin a little below the apex. The membrane and veins are clothed densely with scale-like micrasters; spine-like micrasters are wanting.

Legs.—Moderately short and stout, with scanty short hairs; tibial spurs long and slender, 3:3:3.

Measurements.

	mm.
Length with wings	8.5
" without wings	5.5
Head, from base to apex of labrum, long	1.25
" from base to clypeofrontal suture, long	0.85-0.96
" at and including eyes, wide	0.99-1.07
Antennae, long	1.85
Pronotum, long, 0.63; wide	1.12-1.22
Forewings, long, 6.00; wide	1.70
Tibia iii, long	0.81-0.88

Soldier.

Colour.—Mandibles, postclypeus and frons black, remainder of head, palpi and lateral cervical sclerites dark reddish brown, the head becoming paler towards the base, labrum, anteclypeus, antennae and legs clay colour.

Head.—Short and wide, finely shagreened and bearing scanty short hairs, broadly rounded behind, slightly rounded on the sides, depressed on the vertex; frontal flange indistinct except at its lateral extremities where it is prominent; a short stout horn-like

prolongation of the lower anterior margin of the antennal fossa, a slightly larger one projecting from near the lateral margin of the postclypeus. Frons rugose and sloping at an angle of 45° from the anterodorsal margin to the clypeus. Anteclypeus very short and wide. Labrum a little wider than long, nearly straight on the sides, narrowed sharply from the anterior one third to the pointed apex. Antennae short, with 13 segments; 1st segment short and stout; 2nd about two-thirds the length of the 1st and narrower; 3rd short, narrow and of dark colour; 4th and 5th fused; 6th to 12th moniliform; 13th oval, a little shorter and narrower than 12th. Mandibles comparatively long and slender for the subgenus.

Thorax.—Pronotum a little narrower than head, the anterior margin widely and deeply notched, sides slightly rounded, posterolateral angles broadly rounded, posterior margin wide and slightly sinuate.

Legs.—Short and stout, with scanty hairs; tibial spurs 3:3:3.

Measurements.

	mm.
Total length (head at right angles to body) ..	4.00
Head, base to anterior margin of frontal flange, long ..	1.11
„ to apex of mandibles, long ..	2.03
„ wide	1.25
„ deep	1.03
Antennae, long	1.11
Pronotum, long, 0.77; wide	1.22
Tibia iii, long	0.85

Localities.—Queensland: Toowoomba (type locality). New South Wales: Galston.

Biology.—Two colonies were taken by Mr. T. Greaves near Toowoomba on 27th December in small rotting logs on the ground in dense scrub country, one comprising a king, several alate adults and many nymphs, the other a queen, two soldiers and many larvae. The Galston colony comprised a few soldiers, nymphs and larvae from a dead stump in forest country.

Affinities.—The winged adult of this species may be readily distinguished from all previously described Australian species by its dark colour; it is, however, very similar indeed to the following species (*C. atratus*, n. sp.) from which it differs in its larger size, from one to three additional segments in the antennae, different pronotum, and the absence of spine-like micrasters on the wing membrane. The soldier also is quite different from previously described Australian species in having, *inter alia*, a poorly developed frontal flange and sloping frons. The Galston soldiers differ from those in the type colony as follows:—Head slightly larger and darker and more rugose behind the frontal flange, and the latter slightly more developed.

Types (queen and soldier) and paratypes (including winged adults) in the collection of the Division of Economic Entomology, C.S.I.R., Canberra.

CALOTERMES (CRYPTOTERMES) ATRATUS, n. sp.

(Plate II., Figs. 15-19.)

Winged Adult.

(Figs. 15-19.)

Colour.—Generally similar to that of *Calotermes queenslandis*, n. sp., but darker (nearly black); antennae and legs, excepting tarsi, dark brown, tarsi light yellow.

Head.—Small, longer than wide, widest behind the eyes, posterior margin hemispherical. Eyes small, subtriangular (0.185 diam.). Ocelli small, circular, very near the eyes. Antennae (Fig. 19) with 13 or 14 segments; the 1st segment short and stout; 2nd about one-half as long and two-thirds as wide as 1st; 3rd longer and wider than 2nd, widened at apex; 4th usually shortest and narrowest of all, globose or as long as 2nd and 5th; 5th usually longer and wider than 4th or as in 4th; 6th longer than 5th; 7th-12th increasing in length progressively; 13th as long as 6th, oval, much narrower than 12th. Labrum as long as wide, markedly convex, very little widened on the sides, truncate in front.

Thorax.—Pronotum large, much wider than head, strongly arched dorsally, anterior margin widely concave, anterolateral angles rounded, sides nearly parallel, posterolateral angles slightly oblique, posterior margin slightly sinuate; posterior margin of meso- and metanotum wide, almost straight.

Wings (Figs. 15-18).—Short and moderately wide. Subcosta of forewing very short (wanting in hindwing), usually shorter than width of wing at suture; radius short, about one-third as long as wing; radial sector with seven to nine branches to the anterior margin of the wing; media very variable, generally stout at each end, passing through the wing above the anterior third and joining the radial sector at or beyond the middle of the wing, but sometimes extending to the apex or forming a succession of loops after its first junction with the radial sector; cubitus traversing the wing above the middle, with numerous branches to the posterior margin. The membrane and veins clothed densely with scale-like and minute spine-like micrasters.

Legs.—Short and stout, with scanty short hairs; tibial spurs long, moderately stout, 3:3:3.

Measurements.

	mm.
Length with wings	8.00
" without wings	5.00-5.50
Head, from base to apex of labrum, long	1.07-1.18
" from base to clypeofrontal suture, long	0.85-0.92
" wide	0.92-0.99
Antennae, long	1.59
Pronotum, long 0.55-0.59; wide	1.03-1.18
Forewings, long 6.00; wide	1.66
Tibia iii, long	0.74

Soldier.

Colour.—Mandibles, postclypeus, frons and frontal flange black; gula blackish; anteclypeus whitish; labrum and antennae yellow ochre; palpi and remainder of head chestnut; pronotum chestnut, anterior and posterior margin darker; remainder of thorax and abdomen and legs ochraceous tawny.

Head.—Finely shagreened, short and wide, widest at the posterior fourth, narrowed anteriorly to the anterior third, widened to the greatly thickened frontal flange, the latter deeply cleft medially, and not projecting over the vertical and markedly rugose frons; lower anterolateral margin of head not prolonged; no horn-like projection near the lateral margin of the postclypeus. Antennae short and stout, with 13 segments; 1st segment short, very little longer than it is wide at the apex; 2nd two-thirds the length and width of 1st; 3rd shortest of all, as wide as 2nd, swollen at apex; 4th as wide as 3rd, rounded; 5th-12th approximately equal in width to the 4th, increasing slightly in length progressively; 13th a little shorter and narrower than 12th. Mandibles (dissected from head) short and stout; the left with two forwardly directed pointed teeth in the apical third, a short blunt tooth midway between the posteriormost of the latter and the large molar towards the base of the mandible; the right one with forwardly directed pointed tooth about the middle, a larger and stouter one midway between the latter and the basal molar. Labrum large, wide at base, narrowed to the truncate apex. Postclypeus short and wide, about one-fourth as long as wide; anteclypeus two-thirds as long as the postclypeus, the sides rounded to the broadly truncate apex.

Thorax.—Pronotum short and wide, not as wide as head; the anterior margin bent up, thickened, finely crenellated, widely concave; anterolateral corners bent upwards, thickened, projecting beyond the sides; sides thickened and nearly parallel; posterolateral corners slightly rounded; posterior margin widely but not deeply concave. Posterior margin of meso- and metanotum as in pronotum.

Legs.—Very short and stout, with few hairs; claws and spurs very short and stout; spurs serrate, 3:3:3.

Measurements.

	mm.
Total length	5.00
Head, with mandibles, long	1.88
" wide	1.14
Mandibles (dissected out) long	0.81
Gula, at narrowest part, wide	0.37
Pronotum, long, 0.55; wide	1.07
Tibia iii, long	0.66

Localities.—New South Wales: near Appin (Type locality) and Jamberoo.

Biology.—The above descriptions are from many winged adults and a few soldiers and nymphs taken by Mr. T. Greaves on 1st January, 1930, from an exposed dead root of a living Eucalyptus

tree. A week later several winged adults were taken at Jambaroo by Mr. J. E. Cummins from wood enclosed in a termitarium of an unidentified species.

Affinities.—The resemblance of the winged adult to that of *C. queenslandis*, n.sp. is referred to under the latter species. The soldier is quite distinct from other Australian species, particularly in the absence of horn-like projections from the front of the head.

Types (winged adult male and female, and soldier) in the collection of the Division of Economic Entomology, C.S.I.R., Canberra.

Acknowledgment.

I am indebted to Mr. W. James, C.S.I.R., Canberra, for the excellent photomicrographs which have been used to illustrate this paper.

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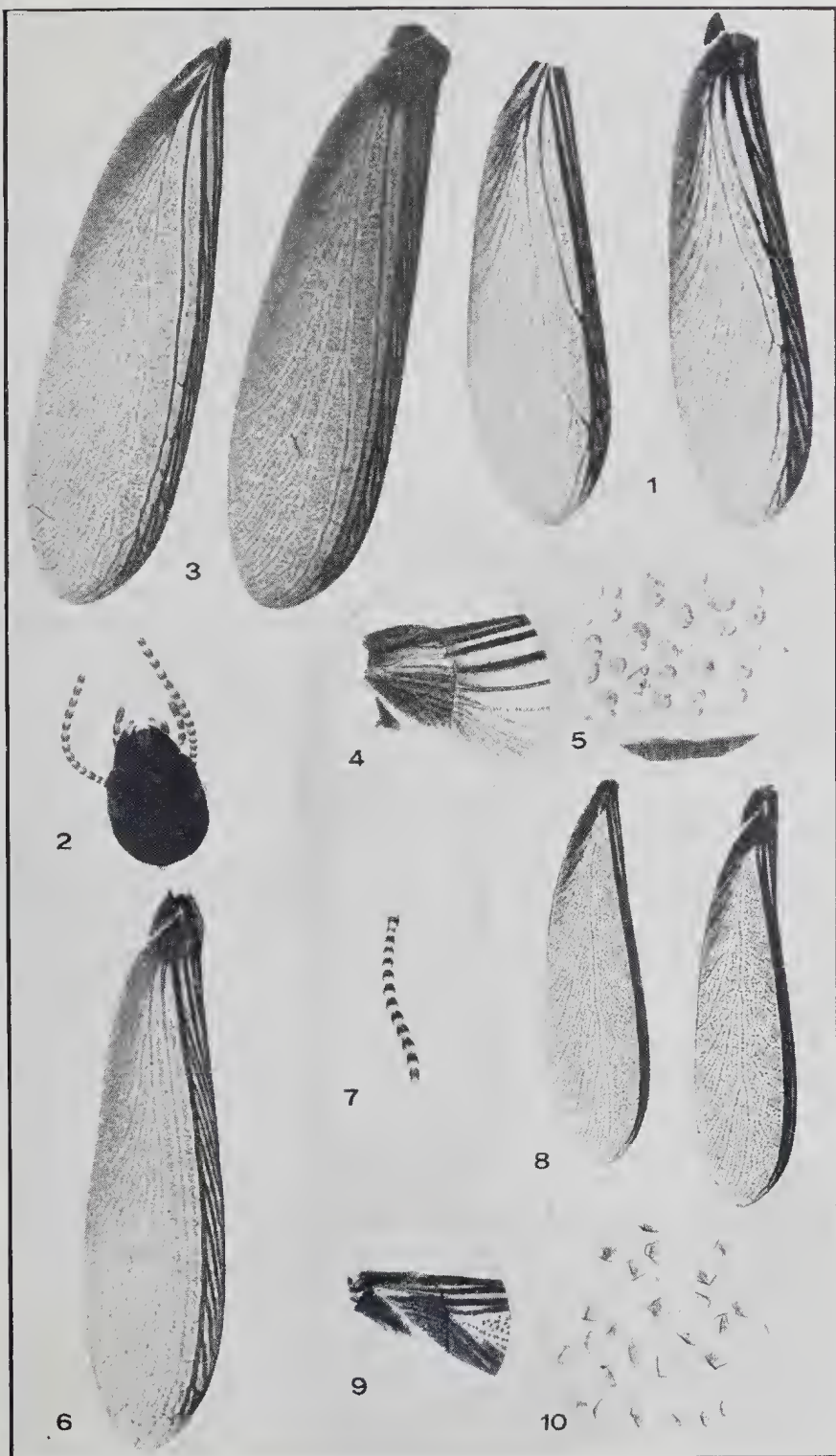
Explanation of Plates I. and II.

PLATE I.

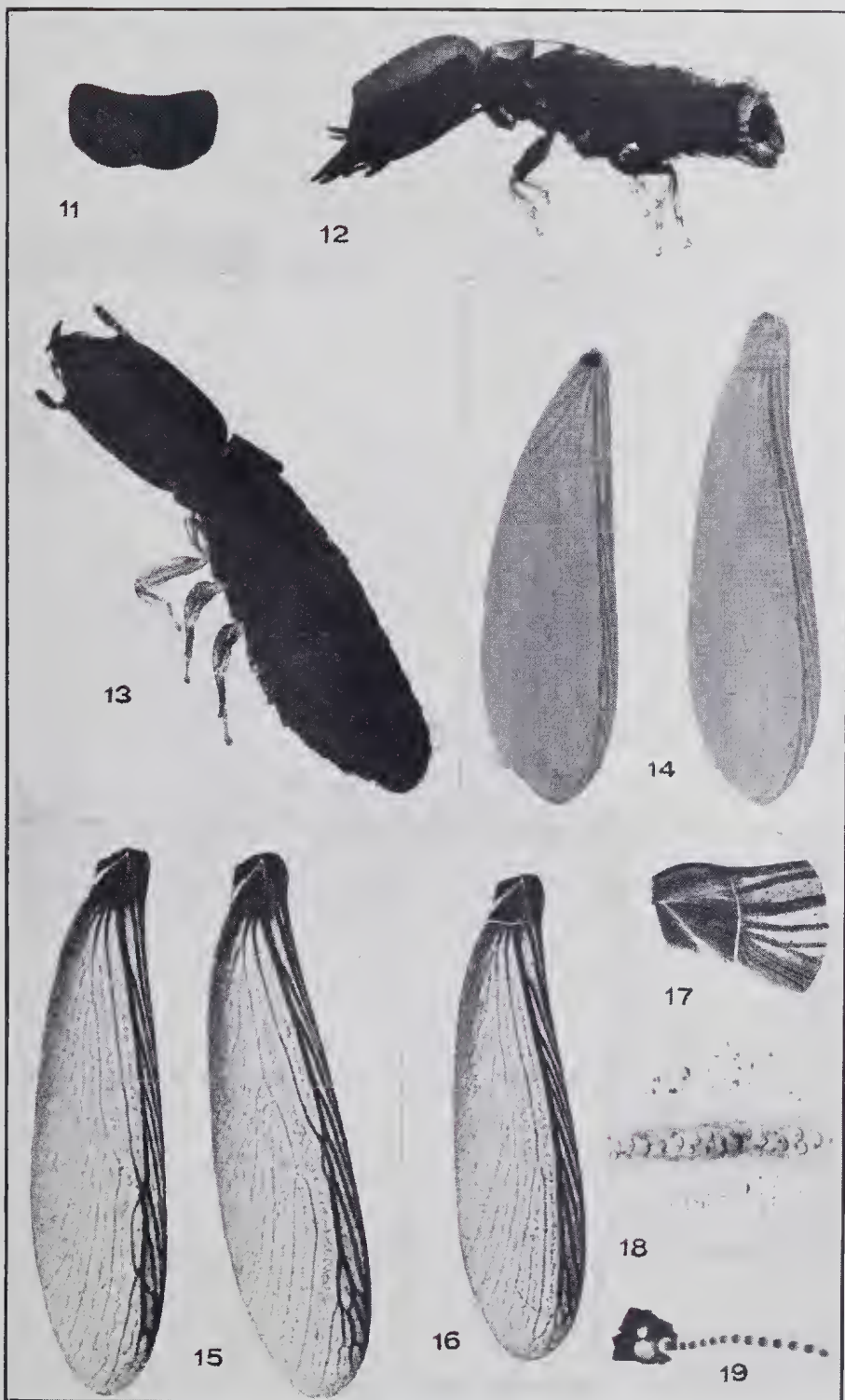
- FIG. 1.—*Calotermes* (subgen. ?) *convexus* (Walker). Fore- and hindwing.
 FIG. 2.—*Calotermes* (subgen. ?) *spoliator* Hill. Head and antennae.
 FIG. 3.—*Calotermes* (subgen. ?) *spoliator* Hill. Fore- and hindwing.
 FIG. 4.—*Calotermes* (subgen. ?) *spoliator* Hill. Base of forewing.
 FIG. 5.—*Calotermes* (subgen. ?) *spoliator* Hill. Wing micrasters (x98).
 FIG. 6.—*Calotermes* (subgen. ?) *tillyardi* Hill. Forewing.
 FIG. 7.—*Calotermes* (subgen. ?) *tillyardi* Hill. Antenna of winged adult.
 FIG. 8.—*Calotermes* (*Glyptotermes*) *neotuberculatus*, n. sp. Fore- and hindwing.
 FIG. 9.—*Calotermes* (*Glyptotermes*) *neotuberculatus*, n. sp. Base of forewing.
 FIG. 10.—*Calotermes* (*Glyptotermes*) *neotuberculatus*, n. sp. Wing micrasters (x98).

PLATE II.

- FIG. 11.—*Calotermes* (*Glyptotermes*) *neotuberculatus*, n. sp. Pronotum of winged adult.
 FIG. 12.—*Calotermes* (*Glyptotermes*) *neotuberculatus*, n. sp. Head of soldier in profile.
 FIG. 13.—*Calotermes* (*Glyptotermes*) *neotuberculatus*, n. sp. Head of soldier from above.
 FIG. 14.—*Calotermes* (*Cryptotermes*) *queenslandis*, n. sp. Fore- and hindwing.
 FIG. 15.—*Calotermes* (*Cryptotermes*) *atratus*, n. sp. Fore- and hindwing.
 FIG. 16.—*Calotermes* (*Cryptotermes*) *atratus*, n. sp. Forewing showing variation from above.
 FIG. 17.—*Calotermes* (*Cryptotermes*) *atratus*, n. sp. Base of forewing.
 FIG. 18.—*Calotermes* (*Cryptotermes*) *atratus*, n. sp. Wing micrasters (x98).
 FIG. 19.—*Calotermes* (*Cryptotermes*) *atratus*, n. sp. Antenna of winged adult.



Calotermes spp.



Calotermes spp.